



Fuel Mass Gauging Under Zero-G Based on Electrical Capacitance Volumetric Tomography Techniques

Problem Statement

- The proposed work plans to test and advance the electrical capacitance volumetric tomography (ECVT) technology to measure mass of propellant fuel stored in a tank operating in a zero -G condition.
- The flights provide ideal zero-G environment for testing ECVT technology for fuel mass gauging.
- NASA's Robotic Refueling Mission, Zero-Boil-Off liquid storage tanks.

Technology Development Team

- PI: Dr. Manohar Deshpande, NASA Goddard Space Flight Center, e-mail: manohar.d.deshpande@nasa.gov
- NASA IPP Program
- NASA's RMM Mission, NASA's ZBO Technologies, Zero-G Basic Science.

Proposed Flight Experiment

Experiment Readiness:

- The ECVT hardware to be flown on NASA's parabolic flight is ready. However, the funding to conduct the experiment will be available during 2014. ECVT instrument will be ready to fly in 2014.

Test Vehicles:

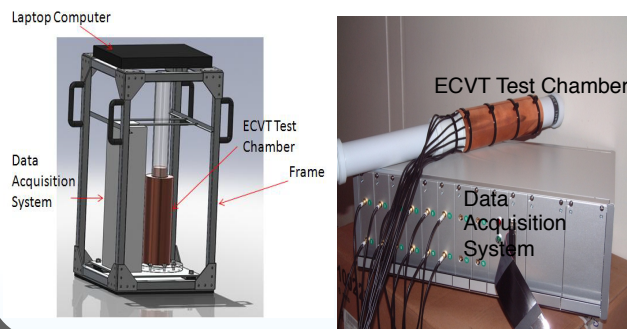
- Zero-G parabolic aircraft

Test Environment:

- Using NASA's Reduced Gravity Education Flight Program, the ECVT instrument has flown on the parabolic flights during 2011 to collect preliminary data

Test Apparatus Description:

- Figure shows ECVT instrument with data acquisition system & mounting frame



Technology Maturation

- Measurement of volume occupied by test targets inside ECVT chamber with 5% accuracy during zero-G flight.
- Conduct experiment with different nonflammable liquid using multiple flights during 2014
- December 30, 2014.

Objective of Proposed Experiment

- Measure mutual capacitance matrix between sensing electrodes when test chamber is partially filled with dielectric balls of different sizes during the parabolic flight.
- Post process the mutual capacitance data using ITNAC inversion algorithm to estimate 3-D dielectric profile of test chamber. Estimate dielectric volume with 5% or more accuracy

List here the applicable Technology Areas addressed by your technology. See www.nasa.gov/offices/oct/home/roadmaps